Utilization of Glass Powder in Fly Ash Bricks

Nayansi Jain[1] Dr. Pramod Sharma[2]
[1]M.E.Scholar [2]Professor
[1,2]Samrat Ashok Technological Institute, Vidisha (M.P.)

Abstract— Fly ash is created in a various measure of amount, particularly by warm power plants. A great batch of inquiry has been channeled out for efficient utilization of fly ash in the structure industry. In manufacturing of brick the Use of Fly ash is the one such thing which is being vigorously analyzed by many research scholars and the engineers. The aim of this dissertation is to evaluate strength of fly ash bricks, which is made up of lime, fly ash, sand and glass powder. In this project fly ash bricks are casted and in it glass power is added upto 50% with an interval of 5%. Pressure molded fly ash bricks is manufactured with glass powder an on it water absorption and compressive strength test is performed. Manufacturing of fly ash bricks and Experiments conducted on fly ash bricks for this project, strictly follows specification given under IS 12894 : 1990.

Key words: Fly ash, Lime, Glass Powder Compressive Strength, Water absorption

I. INTRODUCTION

Fly Ash bricks are cleared of fly ash, lime, gypsum and sand. These can be effectively occupied in all building constructional activities just like the common burnt clay bricks. The fly ash bricks mostly found lighter in weight and more potent rather than common clay bricks respectively. Since fly ash is rapidly being picked up as waste material in huge quantity near thermal power plants and producing severe environmental pollution problems, the main job of the raw material in the manufacture of bricks will not only provide ample opportunities for its proper and useful disposal but as well helps in environmental pollution control to a great extent in the surrounding areas of power plants. In expectation of superior quality and eco-friendly nature, the support of government has increased for the demand of Fly Ash Bricks. Aim of the present study is to use waste like glass powder and Fly ash remains furthermore development of properties of fly ash lime bricks utilizing glass powder, likewise it can fulfill the Indian Standard Provisions. The main scope of the current study is that cost of the development and bricks is minimized, properties of bricks can have altered furthermore most imperative waste material is used.

II. MANUFACTURING OF FLY ASH BRICKS

The particular brick of size 190 mm × 90 mm × 90 (IS: 12894-2002) were thrown in the research center utilizing the glass powder in proportions of fly ash bricks. The specimen was blended with an adequate measure of water to acquire working consistency for molding. The mold was loaded with the lime, fly ash, sand and glass powder without permitting any air bubble. The surplus blend was expelled and top surface was pulled down. For the hand formed bricks, no weight was used to the stamp. The weight formed bricks were set up by applying of 50 KN. The formed block was put aside to dry for two days, shielding from direct sun. The examples were drenched in water at room temperature for 24 hours and from there on, the examples were held out of water. These examples were cured by sodden jute packs for 7, 14 and 28 days. The specimens were tried following 7, 14 and 28 days individually, for compressive strength according to the provisions of Seems to be in IS 3495 (Part 1) - 1992. The water absorption of the bricks was tried according to the provisions fused in IS 3495 (Part 2) - 1992. Before testing, the frogs and voids of the example were topped off with concrete, sand mortar (1: 1). For this project test like compressive strength and water absorption is performed and evaluated.

III. RAW MATERIAL

A. Fly Ash:

Fly ash frames the significant part of the crude min for Fly ash bricks. Hence it controls to a substantial degree the properties of the completed product. As the ash is non-plastic, a fastener must be included either plastic mud or Portland cement. Fly ash content extended from 60 to 80%. The lime was tried according to the provisions of Seems to be: 6932 - 1973. The contaminations present in lime are under 5%. The OMC and MDD were observed to be 42.5% and 1080 kg/m3, separately

B. Sand:

Aggregate which passed from 4.75 mm sieve and contains only so much coarser material as permitted, fine aggregate is natural sand which is resulting from the natural disintegration of rock and which has been deposited by streams or glacial agencies, it is also crushed stone sand which is produced by crushing hard stone, it is also crushed gravel sand which produced by crushing natural gravel.

C. Lime:

It is for the most part attractive to utilize a high calcium lime of sensible immaculateness as it is the most critical constituent which responds with silica and alumina and so forth. These days in the fly ash to make the cover under aqueous conditions other smoldered lime is not reasonable as it stakes readily. The bits of lime ought to be sufficiently alright to be altogether circulated and coat the grains of the blend. It ought to likewise fulfills IS: 712-1973. Lime content reaches from 20 to 30%.

D. Glass Powder:

Glass powder is the powder which is formed by crushing waste glass and also the waste from glass factories. The source of Glass powder in Bhopal is swastik glass supplier. Swastik tile supplier is the supplier of glass product and glass powder in Bhopal.

E. Water:

In the main process potable water from a well or a river is required. Water used for mixing is free from injurious amount of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete.

IV. BRICK COMPOSITION

The mixing proportion (as per Brick composition given above) is generally flying Ash, lime, sand and water. Fly ash reacts with lime in the presence of moisture to form calcium silicate hydrate which is the binder material. After this the mixture is completed and sent to manual presses for molding; which is a molding machine developed by C.B.R.I. In this project total 10 mix has been prepared containing lime, Fly Ash, sand and Glass Powder Content.

S.No.	Fly Ash %	Lime %	Sand %	Glass Powder Added	Mix Name
1	50	40	10	0%	A
2	50	40	10	5%	B
3	50	40	10	10%	C
4	50	40	10	15%	D
5	50	40	10	20%	E
6	50	40	10	25%	F
7	50	40	10	30%	G
8	50	40	10	35%	H
9	50	40	10	40%	I
10	50	40	10	45%	J
11	50	40	10	50%	K

Table 2: Composition of fly Ash Bricks

V. RESULT AND DISCUSSION

A. Water Absorption:

Table 3 and graph 1-2 shows result of water absorption test and it has been observed that when glass powder is added in the proportion of fly ash bricks, decreased the water absorption of fly ash bricks. Fly ash bricks without glass powder possess water absorption about 25.48% and it goes down to 15.39 when 50% glass powder added in it. There is decrement of 5.18% in water absorption when 5% glass powder is added in proportion of bricks and it shows decrement of 40.66% when 50%glass powder added in brick proportion. table 4 and Graph 3-4 shows variation in water absorption of fly ash bricks.

S.No.	Mix Name	Water Absorption
1	A	25.48%
2	B	24.16%
3	C	23.84%
4	D	23.08%
5	E	21.75%
6	F	19.67%
7	G	19.32%
8	H	18.55%
9	I	16.87%
10	J	15.39%
11	K	15.12%

Table 3: Result of Water Absorption Test

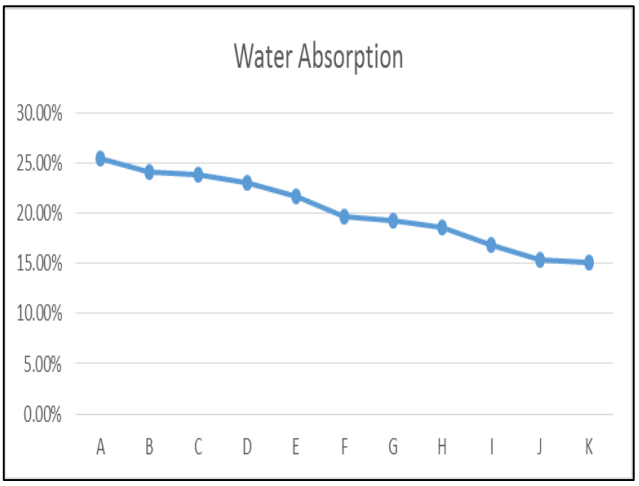

Fig. 1: Graph 1: Result of Water Absorption Test (Line Graph)

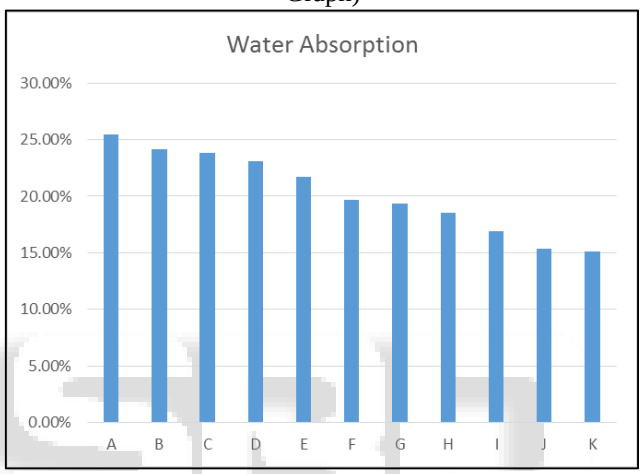

Fig. 2: Graph 2: Result of Water Absorption Test (Bar Chart)

S.No.	Mix Name	Variation Water Absorption of Fly Ash Bricks
1	A	--
2	B	-5.18%
3	C	-6.44%
4	D	-9.42%
5	E	-14.64%
6	F	-22.80%
7	G	-24.18%
8	H	-27.20%
9	I	-33.79%
10	J	-39.60%
11	K	-40.66%

Table 4: Variation in Water Absorption of Fly Ash Bricks

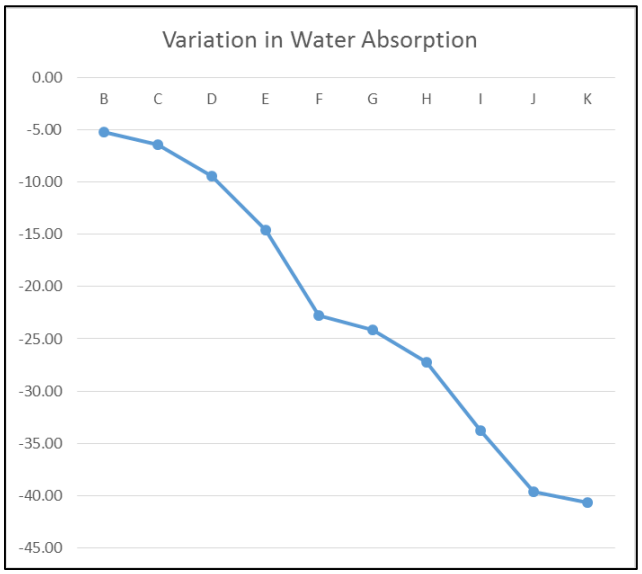

Fig. 3: Graph 3: Variation in Water Absorption of Fly Ash Bricks (Line Graph)

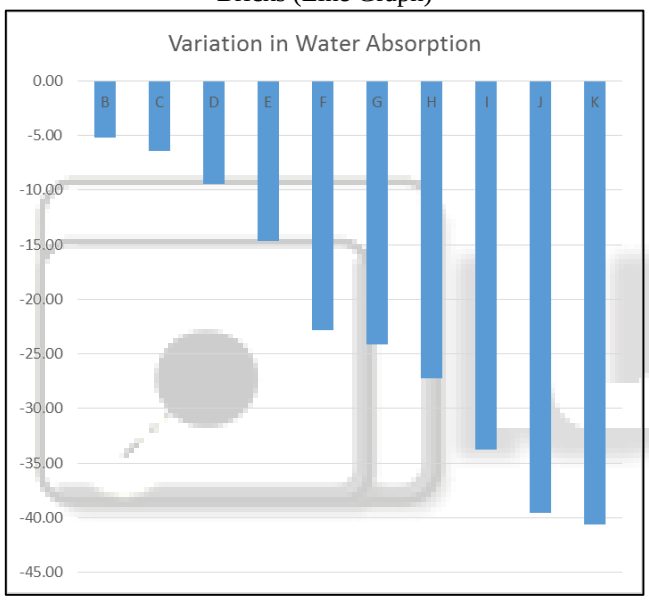

Fig. 4: Graph 4: Variation in Water Absorption of Fly Ash Bricks (Bar Chart)

B. Compressive Strength:

Compressive strength of the fly ash bricks goes on increasing with the glass powder content increases in the fly ash bricks. Table 5 and graph 5-6 shows result of compressive strength result of fly ash bricks. After 28 days of curing fly ash bricks without glass powder possess 6.51 Mpa compressive strength which increases to 16.74 Mpa when 50% glass powder added in it. Table 6 and graph 7-8 shows variation in compressive strength of fly ash bricks, mix B with 5% glass powder shows 3.07% increment in compressive strength and mix K with 50% glass powder gives increment of 157.14% when it is compare to fly ash bricks without glass powder

S.No.	Mix Name	Compressive Strength (Mpa)		
		7 Days	14 Days	28 Days
1	A	5.1	5.41	6.51
2	B	5.6	6.21	6.71
3	C	5.75	6.3	7.9
4	D	5.95	6.81	8.11
5	E	6.22	7.15	8.81
6	F	8.34	9.47	10.85
7	G	9.5	10.3	12.35
8	H	9.91	11.12	13.29
9	I	10.31	12.17	15.58
10	J	11.62	13.61	15.91
11	K	12.34	14.56	16.74

Table 5: Compressive strength test result of fly ash bricks

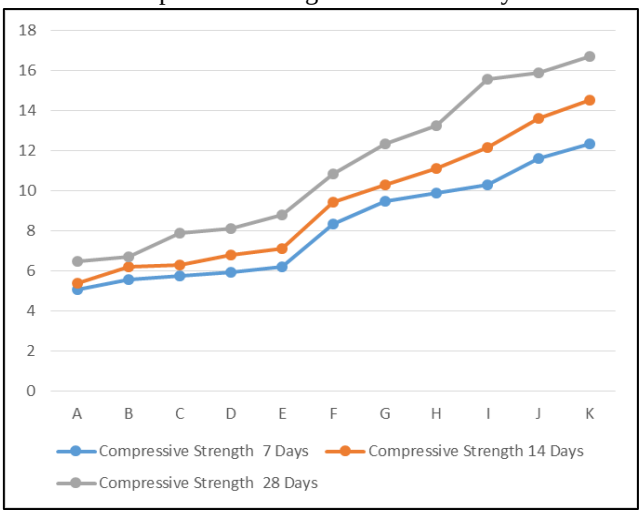

Fig. 5: Graph 5: Compressive strength test result of fly ash bricks (Line Graph)

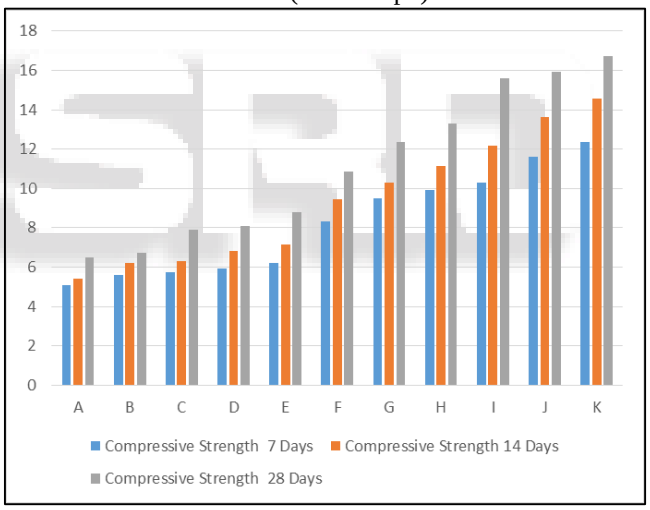

Fig. 6: Graph 6: Compressive strength test result of fly ash bricks (Bar Chart)

S.No.	Mix Name	Variation of Compressive Strength of Fly Ash Bricks
1	A	--
2	B	3.07%
3	C	21.35%
4	D	24.58%
5	E	35.33%
6	F	66.67%
7	G	89.71%
8	H	104.15%
9	I	139.32%
10	J	144.39%
11	K	157.14%

Table 6: Variation in Compressive Strength of Fly Ash Bricks

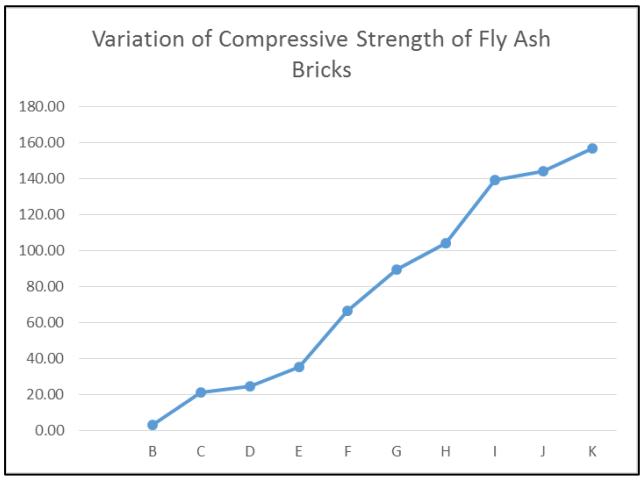

Fig. 7: Graph 7: Variation in Compressive Strength of Fly Ash Bricks (Line Graph)

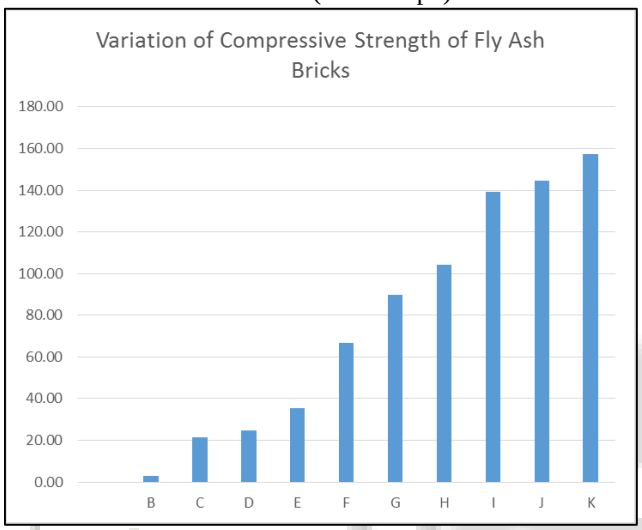

Fig. 8: Graph 8: Variation in Compressive Strength of Fly Ash Bricks (Bar Chart)

VI. Conclusion

In this study, properties of fly ash bricks like compressive strength and water absorption is evaluated when glass powder is added in it which is varies from 0% to 50% at an interval of 5%. Conclusion which derived from the current study is given below.

Different composition of fly ash bricks with glass powder is evaluated and it has been observed that, Water absorption of of fly ash bricks decreases when glass powder added in the composition of fly ash bricks. Water Absorption of fly ash bricks decreases with the increasing percentage of glass powder in fly ash bricks composition. We also observed that upto 41% decrement in compressive strength when glass powder is added in fly ash brick composition upo 50%. As per Indian standard IS 12894 : 1990, maximum allowable water absorption for fly ash bricks is 20% and from the current study we observed that only 6 composition of fly ash bricks gives water absorption less than 20% and satisfies IS requirement.

Current study also evaluated compressive strength of fly ash bricks, compressive strength of bricks increases when glass powder added in the composition of fly ash bricks. Compressive strength of fly ash bricks increases with the increasing percentage of glass powder in fly ash bricks composition. We also observed that upto 157% increment in compressive strength when glass powder is added in fly ash brick composition upo 50%. As per Indian standard IS12894 :1990, minimum average compressive strength for least grade is 7.5 Mpa and current shows on the basis of compressive strength 9 brick composition gives compressive strength more than 7.5 Mpa i.e. when glass powder is added in brick composition upto 10% or more than 10% it gives compressive strength more than 7.5 Mpa which satisfies IS requirements.

References

[1] D.L. Narsimha Rao, Editor “Cement and Building Materials Form Industrials Wastes Proceedings of the national conference” July 24-25' 1992 (India).
[2] Workshop on Utilization of Fly Ash, May 19-20, 1988 (Roorkee).
[3] Civil Engineering and Construction Review(a) April' 1999 (b) December' 1994 (c) October 1995.
[4] Environmental Construction and Valuation [Research - Paper] by B.N.Purohit from the Institution of values, Gujarat zone.
[5] Sardarnagar Building Center (Supported by HUDCO), Mahemdabad 8. NTPC's Guide for users of coal ash. 1999.' Delhi.
[6] Building Materials in India: Last 50 years BMTPC 10. Indian Concrete Journal, July 1992 Subject: i) New trend in bricks and blocks: the role of FaL-G N. Bhanumathidas and N.Kalidas 11. The Indian Concrete Journal 'November 1993 Subject: i) Commercialization of fly ash. --P.C. Gupta and S.C. Ray
[7] American Concrete Institute Journal September - Octomber ' 1987
[8] New Building Materials and Construction World October, 2000, B.N.Agrawal, S.M.Kohli
[9] Indian Standard, Guidelines For Utilisation and Disposal of Fly Ash, IS: 10153 - 1982, Indian Standards Institution, New Delhi.
[10] Indian Standard Specification For Fly Ash, IS : 3812 (Part I) - 1966 For Use As Pozzolana IS : 3812 (Part II) - 1966 For Use As Admixture For Concrete, Indian Standards Institution, New Delhi.
[11] Gujarat Narmada Fly ash Company Limited, 901, A-Wing, Alkapuri Arcade, R.C.Dutt Road, Vadodara - 390 005 18. Kesarjan Building Centre Pvt. Ltd., Kerala G.I.D.C., Near Bavla District, Ahmadabad. - Promoted by Govt, of India, through “Housing and Urban Development Corporation (HUDCO)".
[12] The main basic concept of this test is based on Journal of Institute of Engineers, Vol. 82, June 2001 by N.N. Bhise, CBRI, Roorkee.
[13] Samir Mistry (2002); “Thesis report on study on compressive strength of fly ash bricks”, Sardar Patel university, V.V.Nagar 21. Jayesh Pitroda (2010); paper on “A study of utilization aspect of fly ash in Indian context”.

